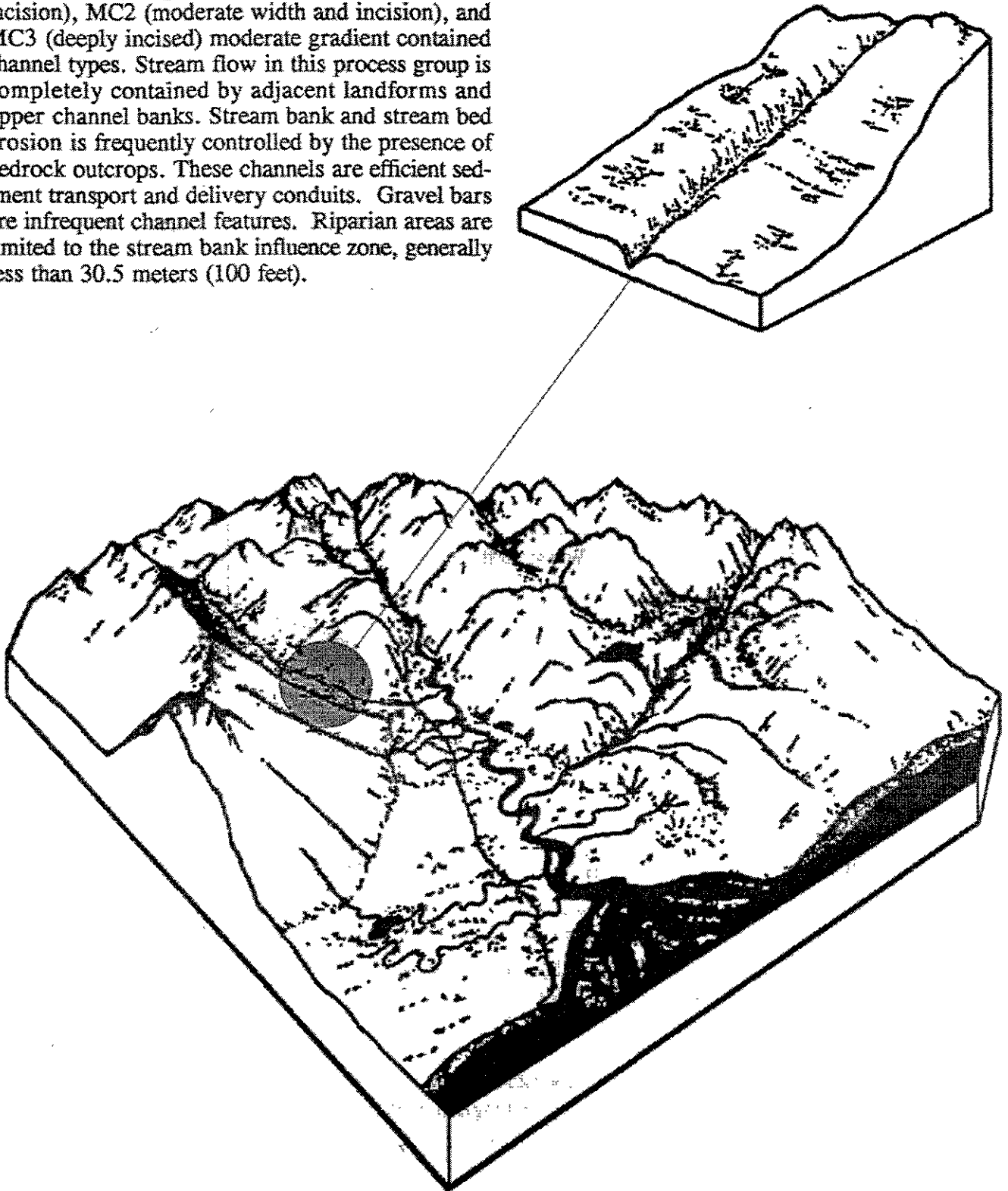


MODERATE GRADIENT CONTAINED PROCESS GROUP

This process group includes MC1 (narrow, shallow incision), MC2 (moderate width and incision), and MC3 (deeply incised) moderate gradient contained channel types. Stream flow in this process group is completely contained by adjacent landforms and upper channel banks. Stream bank and stream bed erosion is frequently controlled by the presence of bedrock outcrops. These channels are efficient sediment transport and delivery conduits. Gravel bars are infrequent channel features. Riparian areas are limited to the stream bank influence zone, generally less than 30.5 meters (100 feet).

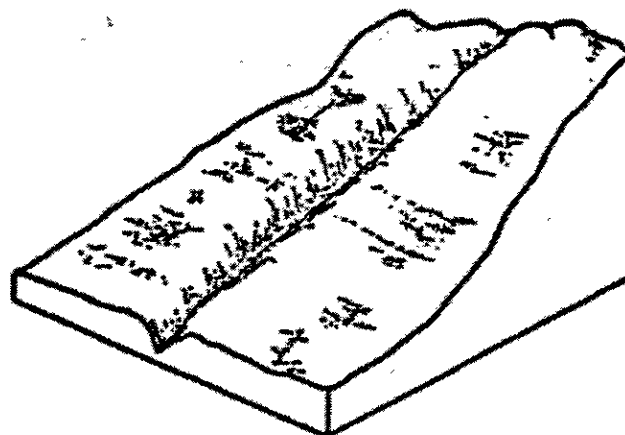


NARROW SHALLOW CONTAINED CHANNEL

Channel Mapping Symbol: MC1 (Formerly B4)

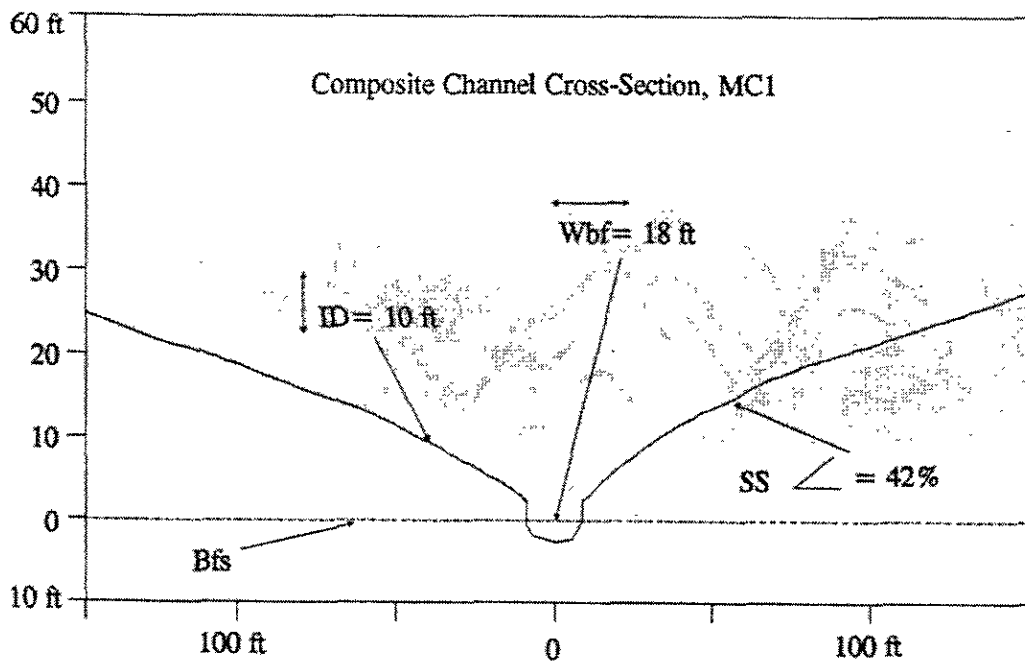
PHYSICAL CHARACTERISTICS

Geographic Setting: The MC1 is found consistently in glacially scoured lowland landforms. Hillslope landforms are often immediately adjacent to these streams. Less frequently, the MC1 is situated in middle to upper valley positions or low elevation drainage divides.



Similar Channel Types: MC2, MM1

Channel Structure



- Stream Gradient:1-6%, mean = 3%
- Incision Depth:< 4 m (13 ft), mean = 3 m (10 ft)
- Bankfull Width:.....< 10 m (33 ft), mean = 6 m (18 ft)
- Dominant Substrate:Cobble to bedrock
- Stream Bank Composition:Bedrock or mixed
- Sideslope Length:Variable, < 20 m (66 ft), mean = 14 m (45 ft)
- Sideslope Angle:Mean = 42% (25 degrees)
- Channel Pattern:.....Single, linear rectangular pattern
- Drainage Basin Area:.....2.6-5.2 km² (1-2 mi²)

INCHANNEL PHOTO: MC1



Riparian Vegetation: The riparian plant communities are dominated by the mixed conifer series, with significant components of nonforested plant communities, shore pine series, and western hemlock series. The nonforested component is predominantly muskeg bog communities.

Plant Association Series	% Cover
Mixed Conifer	27%
Nonforest	18%
Western Hemlock	15%
Shore Pine	14%
Western Hemlock-Red Cedar	8%
Mountain Hemlock.....	7%
Western Hemlock-Alaska Cedar.....	7%

Channel Type Phases:

- MC1m - MUSKEG PHASE is typically a high energy system with muskeg bog and shrub riparian vegetation. Fish habitat associated with large woody debris may be less in this phase than is typical for MC1 channel types.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: MC1 channels function as sediment transport systems. Moderate gradients and flow containment result in moderate stream energy. Material delivered by high gradient, contained channels is quickly transported downstream. Inchannel storage of fine sediment (sands and gravels) is minor. Stream banks and sideslopes contribute very little to sediment loads in MC1 channels.

MODERATE GRADIENT CONTAINED PROCESS GROUP

Aquatic Habitat Capability

Large Woody Debris < 1000 ft³/1000 linear ft
Available Spawning Area (ASA) Avg = 5% for 24 sites
Available Rearing Area (ARA) Avg = 15% for 24 sites

Indicator Species Ratings

<u>MIS</u>	<u>ASA</u>	<u>ARA</u>
Coho.....	LOW	MOD
Pink.....	NEG	NEG
Chum.....	NEG	NEG
Sockeye.....	NEG	NEG
Chinook.....	NEG	NEG
Dolly Varden.....	LOW	LOW
Steelhead.....	NEG	NEG

MC1 channels are generally not accessible to anadromous species because of downstream barriers. Where accessible, spawning habitat is limited, with spawning gravels occurring in patches separated by bedrock or boulder substrate. Coho salmon and Dolly Varden char spawn in these channels. While the ARA is rated low to moderate, coho and Dolly Varden use the pools (19% of active water) for summer rearing. Overwintering habitat is minimal, due to the relatively shallow pools (mean depth = 0.18 meters [0.6 feet]).

Riparian Management Considerations

Concern for Management of:

Large Woody Debris LOW
Sediment Retention LOW
Stream Bank Sensitivity LOW
Sideslope Sensitivity LOW
Flood Plain Protection Need N/A
Culvert Fish Passage..... LOW

The MC1 channel type is very stable with few water quality, fish habitat, or riparian management concerns. These are well contained channels with significant bedrock control for stream banks and stream bed. Sediment retention is low due to moderate gradient and limited sediment sources from stable sideslopes.

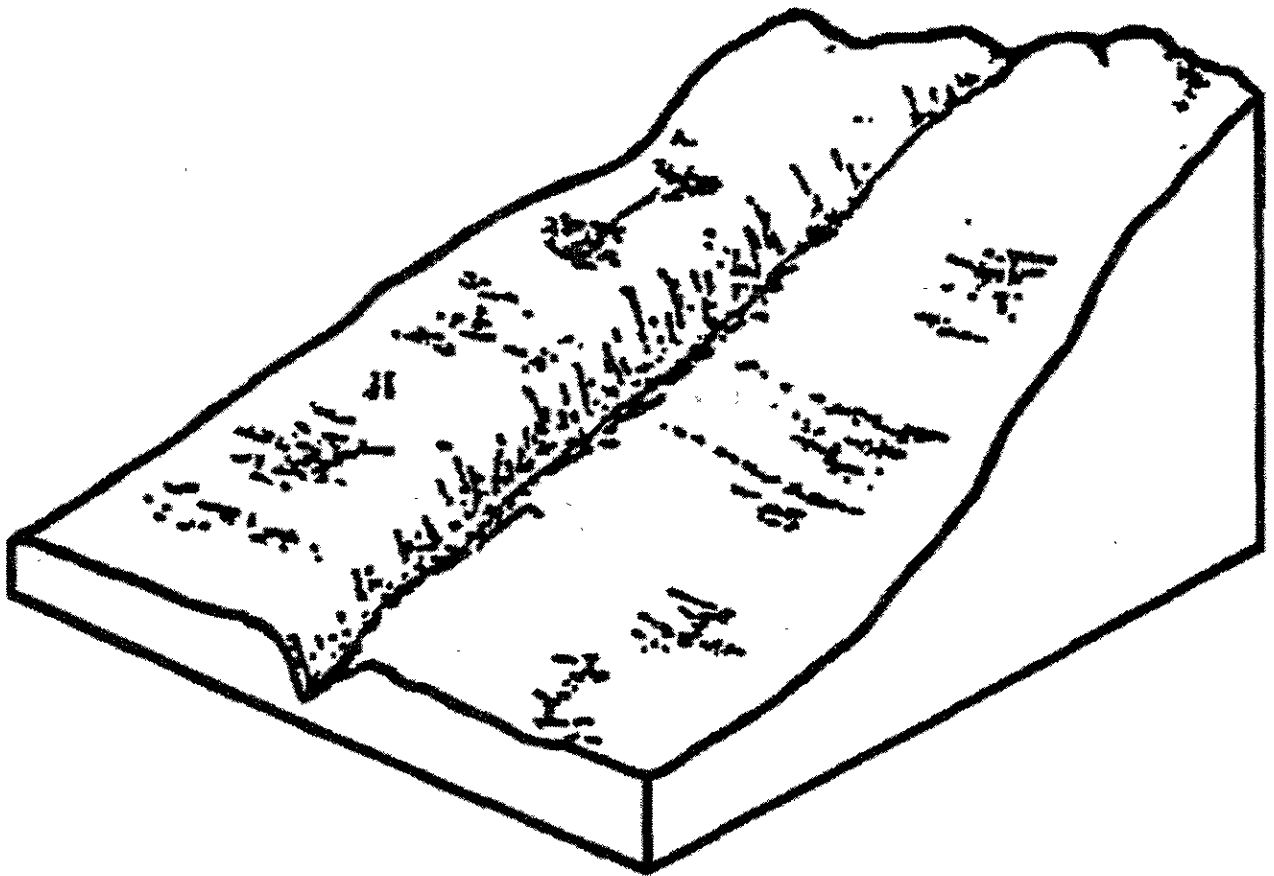
Upper segments of MC1 channels and most headwater reaches are not accessible to anadromous fish, however, anadromous fish passage through culvert crossings can be an important management concern in some stream segments (BMP 14.17).

These are generally classified as Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential N/A
Enhancement Opportunities N/A

Moderate Gradient Contained Process Group

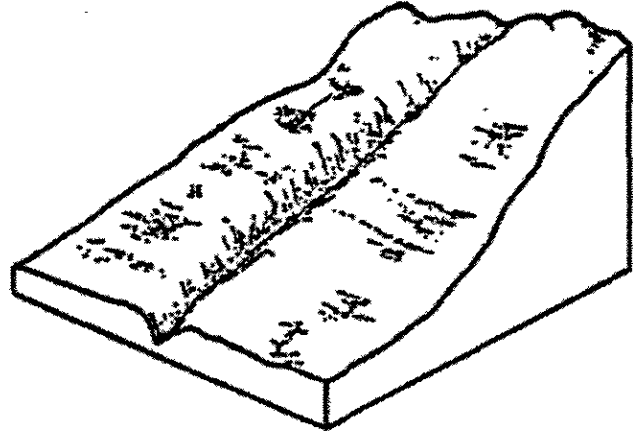


MODERATE WIDTH AND INCISION, CONTAINED CHANNEL

Channel Mapping Symbol: MC2 (Formerly B6)

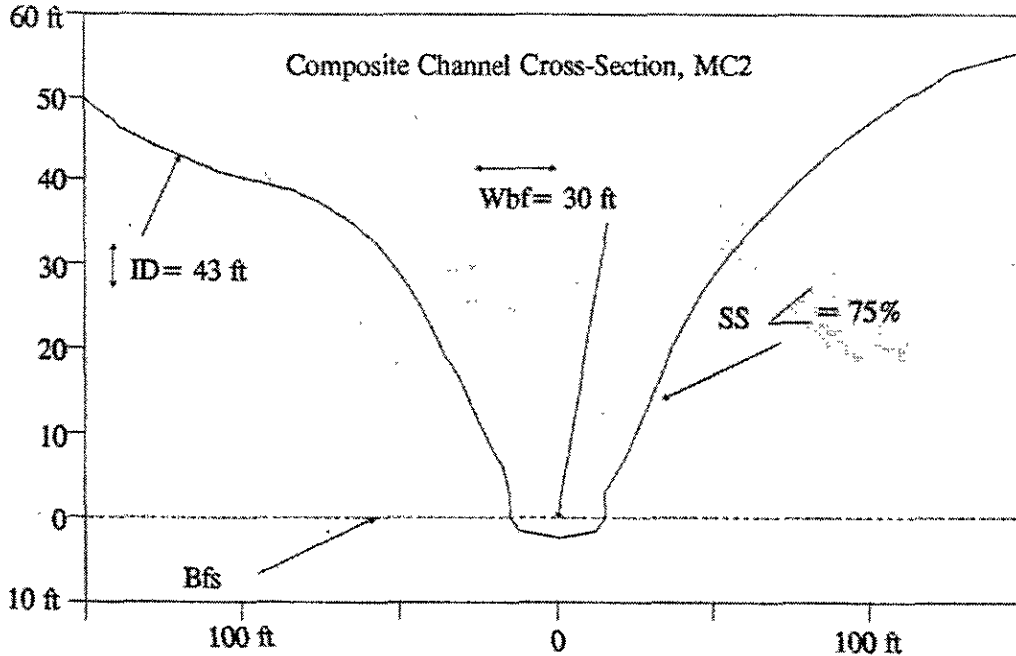
PHYSICAL CHARACTERISTICS

Geographic Setting: MC2 channels are associated with glacially scoured lowland and low relief hillslope landforms. These well contained channels are confined by adjacent landforms. MC2 channels are typically main tributary or upper valley streams with small to moderate sized drainage basins. Bedrock control of channel banks and stream bed is prevalent, resulting in a single linear to rectangular channel pattern.



Similar Channel Types: HC4, HC2, MC1

Channel Structure



- Stream Gradient:2-6%, mean = 3%
- Incision Depth:4-20 m (13-66 ft), mean = 13 m (43 ft)
- Bankfull Width:.....< 20 m (66 ft), mean = 9 m (30 ft)
- Dominant Substrate:Cobble to bedrock
- Stream Bank Composition:Bedrock to mixed
- Sideslope Length:4-20 m (13-66 ft), mean = 11m (37 ft)
- Sideslope Angle:Mean = 75% (37 degrees)
- Channel Pattern:.....Single, linear channel
- Drainage Basin Area:.....5.2-13 km² (2-5 mi²)

INCHANNEL PHOTO: MC2



Riparian Vegetation: The dominant riparian plant community is the western hemlock series, with western hemlock/blueberry being the most common plant association. The mixed conifer series and the Sitka spruce series are also significant riparian vegetation components. Nonforested plant communities are important stream edge communities with red alder and muskeg bog being the most dominant.

Plant Association Series	% Cover
Western Hemlock	40%
Mixed Conifer	15%
Sitka Spruce.....	14%
Western Hemlock-Alaska Cedar.....	11%
Nonforest.....	6%
Mountain Hemlock.....	6%
Western Hemlock-Red Cedar.....	5%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: MC2 channels are sediment transport systems. Stream energy is high due to moderate channel gradient and high flow containment. As a result, inchannel sediment storage, as gravel bars, is low. Fine sediment is easily flushed through these channels. Stream bank erosion is variable due to a high degree of bedrock control. Shallow mass wasting of weathered bedrock and poorly consolidated glacial till on channel sideslopes, though generally not frequent, is a primary source of sediment in MC2 channels.

MODERATE GRADIENT CONTAINED PROCESS GROUP

Aquatic Habitat Capability

Large Woody Debris5700 ft³/1000 linear ft
Available Spawning Area (ASA).....Avg = <1% for 19 sites
Available Rearing Area (ARA).....Avg = 11% for 19 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho.....	LOW	MOD
Pink.....	LOW	NEG
Chum.....	LOW	NEG
Sockeye.....	NEG	NEG
Chinook.....	NEG	NEG
Dolly Varden.....	MOD	MOD
Steelhead.....	LOW	MOD

MC2 channels are moderately accessible to anadromous species as migration barriers frequently occur within these reaches. Coho and Dolly Varden will use isolated pockets of spawning gravel. Coho, steelhead, and Dolly Varden will take advantage of the moderate ARA (11%). Most rearing habitat is associated with pools (11% of water surface area) that have cover provided by large debris jams and boulders. Overwintering habitat is marginal in MC2 channels. Other anadromous species make minimal use of available spawning and rearing areas.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris MOD
Sediment Retention LOW
Stream Bank Sensitivity LOW
Sideslope Sensitivity MOD
Flood Plain Protection..... N/A
Culvert/Fish Passage LOW

Large woody debris volume is moderately high in MC2 channels, however, much of this debris is suspended above the level of normal stream flow stage and along channel banks. Therefore, in many stream segments, large woody debris may not contribute significantly to inchannel habitat. Debris transport is less than in larger contained channels, such as LC1 and LC2 channel types, due to lower flow volume. The limited spawning and rearing habitat available in MC2 stream segments is mostly associated with woody debris. Much of this debris is derived from shallow mass wasting and blow down along steep (75%) channel sideslopes. Debris jams trap bedload sediment and are important in maintaining pool habitat. Therefore, management of large woody debris recruitment is a moderate concern (BMP 12.6).

Shallow organic soils and weathered bedrock along MC2 sideslopes are susceptible to mass wasting. Stream sideslope disturbance from road construction (BMPs 14.7, 14.8, 14.12) is a moderate concern. These potentially unstable areas should be considered in the location, design, and construction of roads within MC2 riparian areas (BMPs 14.2, 14.3).

Suitable bridge crossing sites can be difficult to find on MC2 channels because of moderate channel incision depth and steep channel sideslopes. Culverts are not generally appropriate crossing structures in these channels because of high flow volume and debris transport potential. Anadromous fish passage is another common concern for crossing structure design and maintenance (BMPs 14.17, 14.20).

These are generally classified as Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential..... LOW

Enhancement Opportunities Large Wood Placement and Barrier Modification

Placement of large wood structures can be utilized to improve marginal spawning and rearing habitat. Boulder and rock structures can also be used effectively to enhance habitat in MC2 channel types. Barrier modification is viable in some situations where falls are not numerous and sufficient upstream habitat exists.

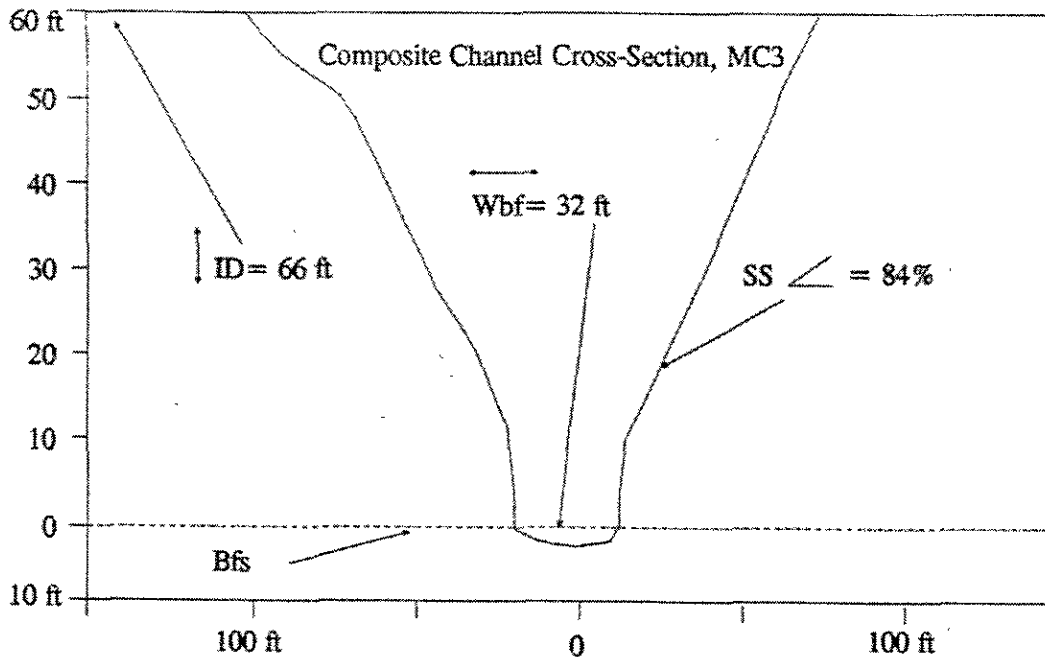
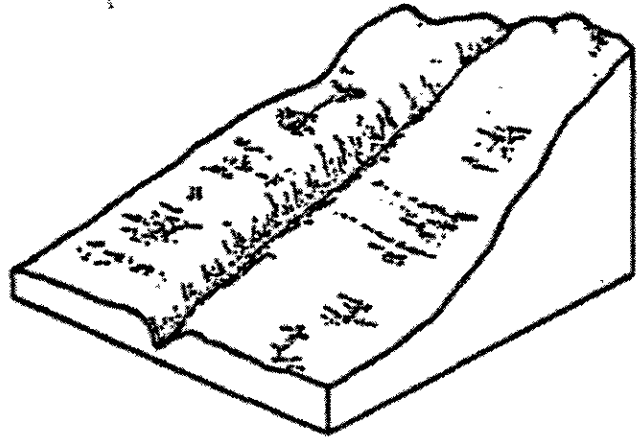
DEEPLY INCISED CONTAINED CHANNEL
Channel Mapping Symbol: MC3 (Formerly B7)

PHYSICAL CHARACTERISTICS

Geographic Setting: MC3 streams are exclusively associated with the valley bottom gorge landform (54). This channel typically cuts through bedrock and has very long, steep, sideslope walls. One or more major falls are normally present.

Similar Channel Types: HC3, HC8, LC2

Channel Structure



- Stream Gradient: > 4%, mean = 5%
- Incision Depth: > 10 m (33 ft), mean = 20 m (66 ft)
- Bankfull Width: < 20 m (66 ft), mean = 10 m (32 ft)
- Dominant Substrate: Small cobble to bedrock
- Stream Bank Composition: Bedrock
- Sideslope Length: > 15 m (50 ft), mean = 20 m (66 ft)
- Sideslope Angle: Can be vertical, mean = 84% (40 degrees)
- Channel Pattern: Single, linear channel
- Drainage Basin Area: 2.6-13 km² (1-5 mi²)

INCHANNEL PHOTO: MC3



Riparian Vegetation: The western hemlock series is the dominant riparian plant community, with western hemlock/blueberry being the most common plant association. The Sitka spruce series and the nonforested plant communities are also significant. Nonforested plant communities, dominated by Sitka alder and devil’s club shrub communities, occur as a fringe 23 percent of the time.

Plant Association Series	% Cover
Western Hemlock	54%
Sitka Spruce	12%
Nonforest	12%
Mixed Conifer	10%
Western Hemlock	8%
Western Hemlock-Alaska Cedar.....	5%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: Regardless of the position of MC3 channels in the watershed network, they function as sediment transport systems. High gradient tributary channels route sediment to the MC3 streams. Bedrock falls, boulder strewn cascades, and steep gradient chutes are common channel features. High stream energy results in efficient transport of both coarse bedload sediment and fine sediment particles.

Aquatic Habitat Capability

- Large Woody DebrisInsufficient data
- Available Spawning Area (ASA).....Insufficient data
- Available Rearing Area (ARA).....Insufficient data

MODERATE GRADIENT CONTAINED PROCESS GROUP

Indicator Species Ratings

<u>MIS</u>	<u>ASA</u>	<u>ARA</u>
Coho.....	LOW	LOW
Pink.....	NEG	NEG
Chum.....	NEG	NEG
Sockeye.....	NEG	NEG
Chinook.....	NEG	NEG
Dolly Varden.....	LOW	MOD
Steelhead.....	LOW	LOW

These channels have very limited accessibility to anadromous species due to passage barriers within them. Typically, MC3 channels may get limited use from spawning steelhead and coho salmon, because spawning gravels tend to be scattered in small pockets. Dolly Varden char will also spawn in MC3 channels. Rearing coho occasionally make minor use of these streams. Dolly Varden and steelhead often rear in boulder pool habitats and overwinter in deep scour pools (mean depth 0.49 meters [1.6 feet]).

Riparian Management Considerations:

Concerns for Management of:

Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	HIGH
Flood Plain Protection.....	N/A
Culvert Fish Passage.....	N/A

The large amount of bedrock and boulders create stable stream banks in MC3 channels, however, sideslopes are very steep and extremely unstable. Removal of trees along the steep sideslopes further reduces stability (BMPs 13.2, 13.5, 13.9). Downstream water quality impact associated with mass wasting of MC3 stream sideslopes is a primary management concern.

Stream crossings are rarely feasible on MC3 segments due to precipitous sideslopes and wide gorges (BMPs 14.2, 14.3).

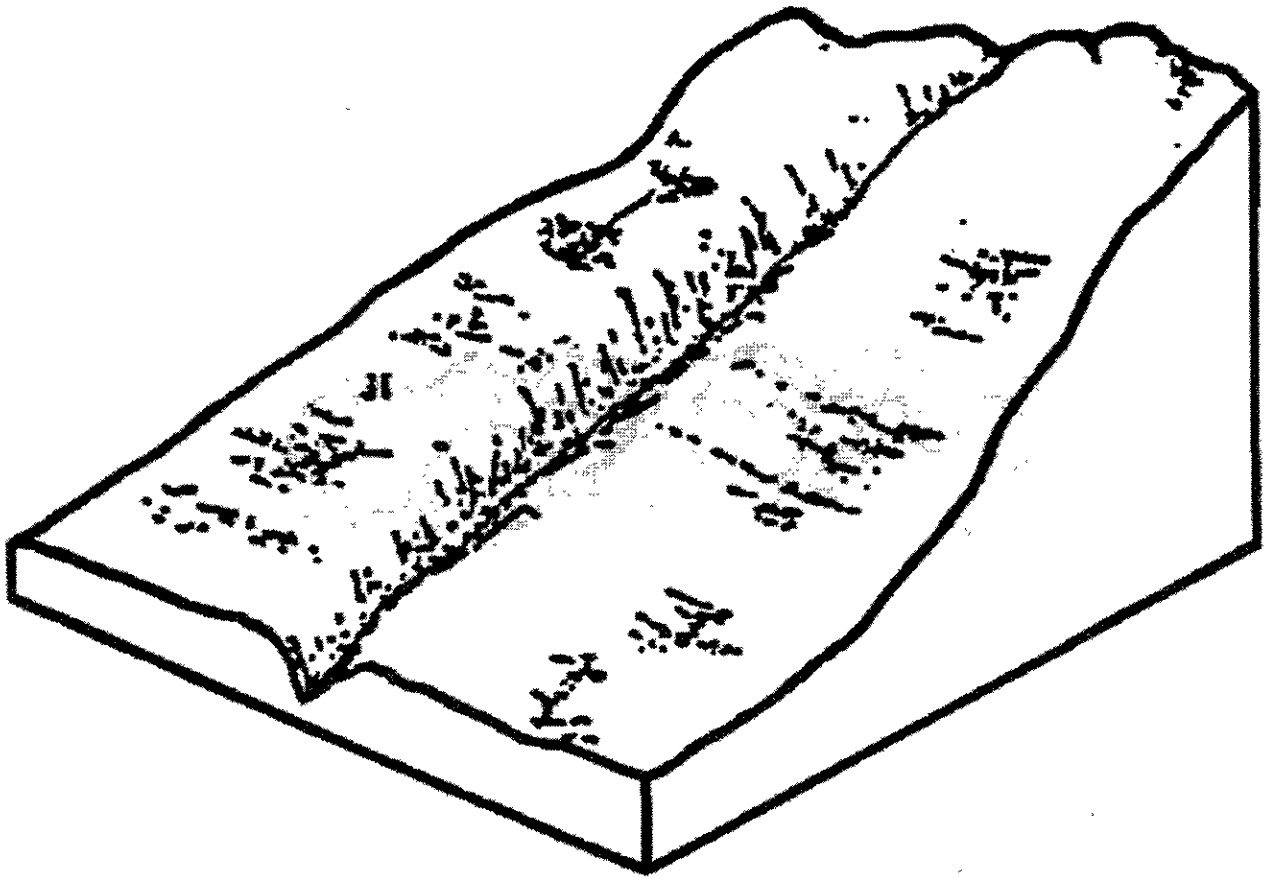
These are typically classified as Value Class II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential.....	N/A
Enhancement Opportunities	N/A

Large waterfalls are common on MC3 channels. Viewing these falls may provide a recreational opportunity where safe access can be provided.

Moderate Gradient Contained Process Group



MODERATE GRADIENT CONTAINED PROCESS GROUP

